



**TECHNOLOGIST PRESENTATION**

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# Bolus administration T1 mapping as a marker of interstitial myocardial fibrosis in severe aortic stenosis

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From 15th Annual SCMR Scientific Sessions  
Orlando, FL, USA. 2-5 February 2012

## Summary

Post-gadolinium bolus T1 mapping was used to assess interstitial myocardial fibrosis in a group of patients with severe aortic stenosis. The changes identified were correlated with regional contractile performance as assessed by CSPAMM tagging. T1 mapping proved to be a practical feasible approach for assessing diffuse fibrosis.

## Background

Aortic stenosis (AS) is associated with increased interstitial myocardial fibrosis (IMF). This is detectable by cardiovascular magnetic resonance (CMR) after gadolinium infusion. T1-mapping-derived partition coefficients ( $\lambda$ ) and extracellular volume fractions (Ve) have also been shown to correlate with IMF after a simple bolus administration of gadolinium. We hypothesized that the  $\lambda$  and Ve would also detect interstitial expansion in severe AS patients compared to healthy controls and that these measures would correlate with abnormal myocardial strain using a high temporal-resolution tagging sequence.

## Methods

A Modified Look-Locker Inversion Recovery (MOLLI) sequence was used to generate eleven T1-weighted images. Myocardial and blood pool T1 values were derived by fitting a signal intensity-time curve using CMR42<sup>®</sup>. The  $\lambda$  was determined by plotting ( $1/T1_{myo}$  vs.  $1/T1_{blood}$ ) at various time points once contrast equilibrium was reached. Ve was derived accounting for the hematocrit. Ventricular long-axis and short-axis T1 maps (basal, mid-ventricular and apical) were acquired

using a 1.5T scanner (Siemens) before and 1,2,5,8,15,20,25 and 30 minutes after contrast. Myocardial tagging images were acquired using both single- and multiple-breath-hold Complementary Spatial Modulation of Magnetization (CSPAMM) sequences in multiple planes and analysed with inTag<sup>®</sup> (Lyon, France).

## Results

Subjects with severe AS displayed higher  $\lambda$  and Ve ( $p=0.02$ ). The  $\lambda$  and Ve correlated with indices of reduced myocardial function including reduced strain ( $p<0.05$ ) and increased left atrial dilatation ( $p=0.001$ ). In this presentation, the tips and pitfalls of T1 mapping using MOLLI will be discussed, including detailed discussion of imaging planes, arrhythmia management, breath-hold times, gadolinium administration and artefact reduction.

## Conclusions

T1-mapping-derived  $\lambda$  and Ve are significantly elevated in patients with AS compared to healthy controls and correlate well with indices of reduced myocardial performance. This difference was quantifiable after a simple bolus administration of gadolinium. T1-mapping  $\lambda$  and Ve derivation after bolus gadolinium administration is clinically practical and holds promise for the detection of IMF in severe AS.

## Funding

This project was supported by the NIHR Royal Brompton Cardiovascular Biomedical Research Unit.

Published: 1 February 2012

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doi:10.1186/1532-429X-14-S1-T4

**Cite this article as:** Wage et al.: Bolus administration T1 mapping as a marker of interstitial myocardial fibrosis in severe aortic stenosis. *Journal of Cardiovascular Magnetic Resonance* 2012 **14**(Suppl 1):T4.

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